

## REMARKS

Claims 1-30 are pending in the application. Claims 1, 6, 10, 11, 12, 20, and 27 are independent, and claims 2-5, 7-9, 13-19, 21-26, and 28-30 are dependent. No claims have been amended. Based on the following Remarks, Applicant respectfully requests that the Examiner reconsider and withdraw all rejections and pass claims 1-30 to allowance.

### Rejection of Claims 1-12 Under 35 U.S.C. § 112, Second Paragraph

In the paragraph 4, the Examiner rejected claims 1-12 under 35 U.S.C. § 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter the Applicants regard as the invention. Applicants respectfully traverse the rejection.

The essential inquiry into a rejection under 35 U.S.C. § 112, second paragraph, indefiniteness rejection is whether the claims set out and circumscribe a particular subject matter with a reasonable degree of clarity and particularity. M.P.E.P. § 2173.02 citing *Solomon v. Kimberly-Clark Corp.*, 216 F.3d 1372, 1379, 55 USPQ2d 1279, 1283 (Fed. Cir. 2000). Definiteness of claim language must be analyzed, not in a vacuum, but in light of: a) the application disclosure, b) the teachings of the prior art, and c) the claim interpretation that would be given by one possessing the ordinary level of skill in the pertinent art at the time the invention was made. *Id.* In reviewing a claim for definiteness, the Examiner must consider the claim as a whole to determine whether the claim appraises one of ordinary skill in the art of its scope and, therefore, serves the notice function required by 35 U.S.C. § 112, second paragraph. *Id.*

With regard to **claim 1**, the Examiner essentially states that the phrases “channel selector tuner” and “external cavity tuner” render the claim indefinite because it is unclear what kind of tuners they are and how they are configured to tune a laser to a selected channel or to a selected optical path length. Applicants respectfully direct the Examiner’s attention to paragraphs.0015-0018 and 0042-0044 (see, e.g., wedge etalon 26, wavelength tuning drive element 36, wavelength controller 38) of Applicant’s Specification. Applicants also respectfully direct the

Examiner's attention to paragraphs **0019** and **0046-0049** (*see, e.g.*, external cavity tuner or drive mechanism **46**, external cavity controller **48**) of Applicant's Specification. These portions of the Specification describe in detail channel selector tuners and external cavity tuners and how each may be configured to tune a laser to a selected channel or an external cavity to a selected optical path length according to embodiments of the present invention.

With regard to **claim 6**, the Examiner essentially states that the phrase "tuning mechanism" renders the claim indefinite because it is unclear how the tuning mechanism is configured to select a transmission wavelength and a cavity optical path length. As for the wavelength tuning mechanism, Applicants respectfully direct the Examiner's attention to paragraphs **0015-0018** and **0042-0044** (*see, e.g.*, wedge etalon **26**, wavelength tuning drive element **36**, wavelength controller **38**) of Applicant's Specification. As for the external cavity mode tuning mechanism, Applicants respectfully direct the Examiner's attention to paragraphs **0019-0018** and **0046-0049** (*see, e.g.*, external cavity tuner or drive mechanism **46**, external cavity controller **48**) of Applicant's Specification. These portions of the Specification describe in detail wavelength tuning mechanisms and external cavity tuning mechanisms according to embodiments of the present invention.

With regard to **claims 10 and 11**, the Examiner appears to state that the term "orthogonal" renders the claim indefinite because it is unclear what the term orthogonal means and how a wavelength tuning element is configured to tune orthogonally with respect to the external cavity mode tuning element. As for the term orthogonal, Applicants respectfully direct the Examiner's attention to paragraphs **0012, 0016-0020, and 0063** of Applicant's Specification. These portions of the Specification describe in detail what the term orthogonal means and how a wavelength tuning element is configured to tune orthogonally with respect to the external cavity mode tuning element according to embodiments of the present invention.

As for the wavelength tuning element and wavelength tuning assembly, Applicants respectfully direct the Examiner's attention to paragraphs **0015-0018** and **0042-0044** (*see, e.g.*, wavelength tuning drive element **36**, wavelength controller **38**) of Applicant's Specification.

These portions of the Specification describe in detail wavelength tuning mechanisms according to embodiments of the present invention.

As for the external cavity mode tuning element, Applicants respectfully direct the Examiner's attention to paragraphs 0019 and 0046-0049 (*see, e.g.*, external cavity tuner or drive mechanism 46, external cavity controller 48) of Applicant's Specification. These portions of the Specification describe in detail external cavity tuning mechanisms according to embodiments of the present invention.

The claim language read in conjunction with at least the above Specification teachings of the disclosure and of the prior art apprises with reasonable clarity and particularity, to one of ordinary skill in the art, the scope of claim 1, 6, and 10-11. Accordingly, Applicants submit claims 1, 6, and 10-11 are patentable and respectfully request that the Examiner reconsider and withdraw the rejections. Claims 2-5 and 7-9 properly depend from patentable claims 1 and 6, respectively, and therefore are patentable as well. Accordingly, the Applicants respectfully request that the Examiner reconsider and withdraw the rejection.

Rejection of the Claims 1-30 Under 35 U.S.C. § 103(a)

In the Office Action, the Examiner rejected claims 1-30 under 35 U.S.C. § 103(a) as obvious over U.S. Publication No. US 2002/0126345 9 to Green et al. (hereinafter "Green") or U.S. Patent No. 6, 282,215 to Zorabedian et al. (hereinafter "Zorabedian") in view of U.S. Patent No. 6,081,539 to Mattori et al. (hereinafter "Mattori"). Applicants respectfully traverse the rejection.

To establish a *prima facie* case of obviousness, an Examiner must show that the references teach each and every element of the claimed invention. (MPEP §2143.) To establish a *prima facie* case of obviousness, an Examiner can modify one or more references, but must show that there is some suggestion or motivation to modify the reference to arrive at the claimed invention. (MPEP §2143.) The suggestion or motivation to modify reference teachings must be found in the references relied upon. (MPEP §2143.01.)

Applicants respectfully submit, and the Examiner acknowledges, that both Green and Zorabedian fail to teach each and every element of the claimed invention. Specifically, the Examiner concedes that Green and Zorabedian fail to teach a channel selector tuner and an external cavity tuner that are independently operable but cites Mattori to make up the deficiencies in Green and Zorabedian stating that it would have been obvious to modify Green or Zorabedian with Mattori to arrive at the claimed invention because a person of ordinary skill in the art will recognize that such modification and variations can be made without departing from the spirit of the invention. Applicants respectfully disagree.

Mattori is directed to a tunable laser. The Examiner states that Mattori teaches that a wavelength tuner and a cavity length tuner are independently operable. Applicants respectfully disagree. Although Mattori teaches "the angle of diffraction grating and the resonance wavelength, i.e., the cavity length, are independently changed," Mattori is very clear that they are not independently operable when it teaches that "*appropriate combinations*" of diffraction angles and associated cavity lengths are obtained in advance via experimentation and stored for later use. That is, Mattori teaches that the angle of diffraction and the cavity length have very specific combinations such that when one is tuned the other follows. This means that they are not independently operable.

Assuming for the sake of argument that the Examiner is correct that a wavelength tuner and a cavity length tuner are independently operable, Applicants respectfully submit that Mattori is not properly applied.

Applicant respectfully direct the Examiner to MPEP §2143.01, which states that any proposed modification cannot render the cited reference unsatisfactory for its intended purpose or change the principle of operation. Applicants respectfully submit that applying such an independently operable wavelength tuner and cavity length tuner to Green or Zorabedian changes the principle of operation of Green or Zorabedian. For example, in the response dated November 26, 2002, Applicants pointed out and provided support the proposition that the channel selector

tuner and the external cavity tuner are *dependently operable* with respect to each other. Applicants also pointed out and provided support for the proposition that the channel selector tuner and the external cavity tuner in Zorabedian are *synchronously operable* with respect to each other. Applying independently operable diffraction angles and associated cavity lengths to a dependently operable channel selector tuner and external cavity tuner and/or synchronously operable channel selector tuner and the external cavity tuner

Because the Examiner has not made out a *prima facie* case of anticipation or a *prima facie* case of obviousness with respect claims 1-30, Applicants respectfully submit that claims 1-30 are patentable. Accordingly, Applicants respectfully request that the Examiner reconsider and remove the rejections to claims 1-30.

#### Drawings

In papers filed herewith, Applicants have submitted a Request for Approval of Drawing Change under 37 C.F.R. §1.121 to correct Figures 1, 3A-3C, 4, and 6. Applicants respectfully request that the Examiner consider and approve the Request.

## CONCLUSION

The Applicant submits that all grounds for rejection have been properly traversed. Therefore, the Applicant respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections and pass claims 1-30 to allowance. The Examiner is invited to telephone the undersigned representative if the Examiner believes that an interview might be useful for any reason.

Respectfully submitted,

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1, 5, 10, 11, 12  
20, 27

**VERSION OF CLAIMS WITH MARKINGS  
TO SHOW CHANGES**

1. A laser including an external cavity, comprising:
  - (a) a channel selector tuner configured to tune said laser to a selected channel; and
  - (b) an external cavity tuner configured to tune said external cavity to a selected optical path length;
  - (c) said channel selector tuner independently operable with respect to said external cavity tuner.
2. The laser of claim 1, wherein:
  - (a) said channel selector tuner is operable according to a channel selection signal; and
  - (b) said external cavity is operable according to a cavity mode signal.
3. The laser of claim 2, wherein said channel selection signal is derived independently from said cavity mode signal.
4. The laser of claim 3, wherein:
  - (a) said channel selection signal is derived from channel selector tuning data in a look-up table; and
  - (b) said cavity mode signal is derived from a detector configured to measure external cavity loss associated with cavity optical path length.
5. The laser of claim 1, wherein:
  - (a) said channel selector tuner is operatively coupled to a first controller and operable according the channel selector tuning data in a look-up table; and
  - (b) said external cavity tuner is operatively coupled to a second controller and operable according to error signals derived from a detector configured to measure external cavity loss associated with cavity optical path length.

*what is external cavity?*

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6. (Amended) An external cavity laser apparatus, comprising:
- (a) a wavelength tuning mechanism configured to select a transmission wavelength according to a wavelength selection signal; and
  - (b) an external cavity mode tuning mechanism configured to select a cavity optical path length according to a cavity mode signal;
  - (c) said wavelength tuning mechanism configured to operate independently from said cavity mode tuning mechanism.
7. The external cavity laser apparatus of claim 6, wherein said wavelength selection signal is derived independently from said cavity mode signal.
8. The external cavity laser apparatus of claim 7, wherein:
- (a) said wavelength selection signal is acquired from wavelength selection data stored in a look-up table; and
  - (b) said cavity mode signal is derived from a detector configured to measure external cavity loss associated with cavity optical path length.
9. The external cavity laser apparatus of claim 6, wherein:
- (a) said wavelength tuning mechanism is operatively coupled to a first controller and operable according to wavelength tuning data in a look-up table; and
  - (b) said external cavity tuning assembly is operatively coupled to a second controller and operable according to error signals derived from a detector configured to measure external cavity loss associated with cavity optical path length.

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- An external cavity laser apparatus, comprising:
- (a) a wavelength tuning element; and
  - (b) an external cavity mode tuning element;

(c) said wavelength tuning element configured to tune orthogonally with respect to said external cavity mode tuning element.

11.

An external cavity laser apparatus, comprising:

- (a) a wavelength tuning assembly; and
- (b) an external cavity optical path length tuning assembly;
- (c) said wavelength tuning assembly operable uncoupled from said external cavity optical path length tuning assembly.

12. An external cavity laser apparatus, comprising:

- (a) a gain medium having first and second output facets, said gain medium emitting a coherent beam from said first output facet along an optical path;
- (b) an end mirror located in said optical path, said end mirror and said second output facet defining an external cavity;
- (c) a wavelength tuning element positioned in said optical path before said end mirror;
- (d) a wavelength tuning assembly operatively coupled to said wavelength tuning element and configured to adjust said wavelength tuning element; and
- (e) a cavity optical path length tuning assembly operatively coupled to said external cavity and configured to adjust said external cavity optical path length;
- (f) said wavelength tuning assembly configured to operate independently from said cavity optical path length tuning assembly.

13. The external cavity laser apparatus of claim 12, wherein:
- (a) a wavelength tuning assembly operates according to a wavelength selection signal; and
  - (b) said cavity optical path length tuning assembly operates according to a cavity mode signal;
  - (c) said wavelength selection signal derived independently from said cavity mode signal.
14. (Amended) The external cavity laser apparatus of claim 13, wherein said wavelength selection signal is derived from wavelength tuning data in a look-up table.
15. The external cavity laser apparatus of claim 13, wherein said cavity mode signal is an error signal derived from a detector configured to measure external cavity loss associated with cavity optical path length.
16. The external cavity laser apparatus of claim 15, wherein said detector comprises a voltage sensor configured measure voltage modulation across said gain medium.
17. The external cavity laser apparatus of claim 13, further comprising a modulation element, said modulation element operatively coupled to said external cavity and configured to introduce a modulation to said cavity optical path length, said modulation usable to derive said cavity error mode signal.
18. The external cavity laser apparatus of claim 13, wherein said cavity optical path length tuning assembly comprises a thermally tunable compensating member, said thermally tunable compensating member coupled to said end mirror.
19. The external cavity laser apparatus of claim 13, further comprising a grid generator positioned in said optical path.

20. (Amended) A method for tuning an external cavity laser, comprising:
- (a) tuning a channel selector with a first tuning element according to a first, wavelength selection signal; and
  - (b) tuning an external cavity optical path length with a second tuning element according to a second, cavity mode error signal;
  - (c) said tuning said channel selector carried out independently from said tuning said external cavity optical path length.
21. (Amended) The method of claim 20, wherein said first wavelength selection signal is derived independently from said second, cavity mode signal.
22. (Amended) The method of claim 20, wherein said tuning by said first tuning element is carried out substantially orthogonally with respect to said tuning by said second tuning element.
23. (Amended) The method of claim 20, further comprising:
- (a) controlling said first tuning element with a first controller; and
  - (b) controlling said second tuning element with a second controller.
24. (Amended) The method of claim 20, further comprising:
- (a) deriving said first, wavelength selection signal from a stored look-up table of adjustment parameter data; and
  - (b) deriving said second, cavity mode error signal from output from a sensor configured to monitor external cavity loss associated with said external cavity optical path length.
25. (Amended) The method of claim 24, wherein said deriving said second, cavity mode error signal comprises monitoring voltage modulation across a gain medium associated with said external cavity.

26. (Amended) The method of claim 24, wherein said deriving said second, cavity mode error signal comprises introducing a frequency modulation to said external cavity optical path length, said frequency modulation detectable by said sensor.

27.

A laser apparatus, comprising:

- (a) wavelength tuning means for adjusting a channel selector;
- (b) external cavity tuning means for adjusting optical path length, and
- (c) means for decoupling said wavelength tuning means from said external cavity tuning means.

28. The laser apparatus of claim 27, further comprising:

- (a) means for deriving a wavelength selection signal for said wavelength tuning means; and
- (b) means for deriving an optical path length signal for said external cavity tuning means;
- (c) said wavelength signal deriving means operable independently from said optical path length signal deriving means.

29. The laser apparatus of claim 27, wherein said wavelength tuning means comprises wavelength selection control means for actuating a channel selector according to signals derived from optical output of said laser.

30. The laser apparatus of claim 29, wherein said external cavity tuning means comprises external cavity control means for actuating a reflector according to signals derived from voltage monitored across a gain medium of said laser.